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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/890,455	03/12/2002	Hiroaki Inoue	2001-1091A	3064

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EXAMINER

GURLEY, LYNNE ANN

ART UNIT	PAPER NUMBER
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2812

DATE MAILED: 02/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/890,455

Applicant(s)

INOUE ET AL.

Examiner

Lynne A. Gurley

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 April 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 5-9 and 18-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 5-9 and 18-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 14.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

This office action is in response to the IDS filed 4/4/03, which was filed before the Notice of Allowance was mailed on 6/3/03 and, which was entered into the file after the Notice of Allowance was mailed 6/3/03. Due to the pertinent prior art listed in the IDS filed 4/4/03, **the Notice of Allowance, mailed 6/3/03, has been withdrawn.** A new office action on the merits is as follows:

Drawings

1. The drawings were received on 3/31/03. These drawings have been approved by the Examiner.

Specification

2. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 5-6, 8, 18 and 20-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Cheung et al. (US 6,258,233, dated 7/10/01, filed 7/9/99).

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Cheung shows the method as claimed as depositing a seed layer in a feature of a substrate, depositing an electroless conductive layer conformally on the seed layer and electroplating a layer over the electroless layer to fill features on the substrate (column 3, lines 53-57). The electroless deposited copper layer fills defects and discontinuities in the seed layer (column 2, lines 42-46). The seed layer and the electroless deposition layer are both copper and, the copper sulfate in solution, which contains hydrogen and oxygen (copper sulfate produces dihydric copper ions in H₂O as described in the specification of the instant invention) and disassociates into copper ions. A complexing agent of EDTA is used. An aldehyde acid is used – formaldehyde or glyoxylic acid. An organic alkali (TMAH) is used. (See column 3, lines 50-67 and column 4, lines 1-58.) The electroless deposition is performed at a rate of 400 Angstroms per minute (40 nm/min) (column 4, lines 54-55).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

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4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 7, 19 and 27-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheung et al. (US 6,258,233, dated 7/10/01) in view of Kikuchi et al. (US 4,563,217, dated 1/7/86).

Cheung shows the method as claimed and as described in the previous paragraphs.

Cheung lacks anticipation only in not teaching: 1) the details of the polyoxyethylene series surface active agent; 2) that the inlet size of the recess is less than 0.18 micron; 3) the concentration of copper ions from 0.01 to 10.0 g/L; 4) the concentration of the EDTA * 4H being 0.5 to 100 g/L; 5) the glyoxylic acid concentration being 1 through 50 g/L and; 6) the pH being adjusted to a range of 10-14.

Kikuchi particularly shows, in a method using an electroless copper plating solution, details of the polyoxyethylene series surface active agent in the dependent claims. Also, the formation of cupric ions is reinforced by $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in Kikuchi, as taught in the specification

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of the instant invention. Kikuchi also teaches the concentrations of the copper ions, the EDTA, the glyoxylic acid and the pH range.


It would have been obvious to one of ordinary skill in the art to have used the polyoxyethylene series surface active agent, and to have used the copper ions, the EDTA, the glyoxylic acid and the pH range as claimed in the method of Cheung, with the motivation that these ranges are reasonable for an electroless plating solution, as taught by Kikuchi.

Additionally, it would have been obvious to one of ordinary skill in the art to have had an inlet size less than 0.18 micron, with the motivation that Cheung already shows deposition in a contact hole, so that the size of the opening being less than 0.18 micron as technology is scaling to the submicron ranges would be reasonable, especially in that the process taught in Cheung yields excellent, enhanced results for such a structure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynne A. Gurley whose telephone number is 703-305-3474. The examiner can normally be reached on M-F 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on 703-308-3325. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 308-308-0956.


LYNNE GURLEY
PATENT EXAMINER
Art Unit 2812

LAG
November 19, 2003